



## Subject card

Subject name and code	Enzymatic Preparations Technology, PG_00058292						
Field of study	Biomedical Engineering, Biomedical Engineering, Biomedical Engineering						
Date of commencement of studies	February 2023		Academic year of realisation of subject		2023/2024		
Education level	second-cycle studies		Subject group		Subject group related to scientific research in the field of study		
Mode of study	Full-time studies		Mode of delivery		at the university		
Year of study	1		Language of instruction		Polish		
Semester of study	2		ECTS credits		3.0		
Learning profile	general academic profile		Assessment form		assessment		
Conducting unit	Department of Chemistry, Technology and Biochemistry of Food -> Faculty of Chemistry						
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. Izabela Sinkiewicz				
	Teachers		dr inż. Izabela Sinkiewicz				
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	30.0	0.0	0.0	45
	E-learning hours included: 0.0						
Learning activity and number of study hours	Learning activity	Participation in didactic classes included in study plan		Participation in consultation hours		Self-study	SUM
	Number of study hours	45		5.0		25.0	75
Subject objectives	The aim of the lecture is to familiarize students with the currently available enzymes, present factors influencing the efficiency of enzymes, the ways of enzyme isolation and purification from biological material and the methods of immobilization and application of immobilized enzymes.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K7_U03] can design, according to required specifications, and make a complex device, facility, system or carry out a process, specific to the field of study, using suitable methods, techniques, tools and materials, following engineering standards and norms, applying technologies specific to the field of study and experience gained in the professional engineering environment	The student measures the activities of the enzyme preparations. The student characterizes enzyme preparations and evaluates their usefulness.	[SU2] Assessment of ability to analyse information [SU1] Assessment of task fulfilment
	[K7_W03] Knows and understands, to an increased extent, the construction and operating principles of components and systems related to the field of study, including theories, methods and complex relationships between them and selected specific issues - appropriate for the curriculum.	The student explains the industrial applications of enzymes.	[SW1] Assessment of factual knowledge
	[K7_K03] is ready to meet social obligations, inspire and organise activities for the social environment, initiate actions for the public interest, think and act in an entrepreneurial way	The student compares enzyme preparations. He selects the type of preparation for a specific process in the food industry. food industry.	[SK2] Assessment of progress of work
	[K7_U05] can plan and conduct experiments related to the field of study, including computer simulations and measurements; interpret obtained results and draw conclusions	The student studies changes in enzyme activity.	[SU2] Assessment of ability to analyse information
	[K7_W05] Knows and understands, to an increased extent, methods of process and function support, specific to the field of study.	The student interprets the criteria for evaluating the suitability of enzyme preparations.	[SW1] Assessment of factual knowledge
	[K7_U02] can perform tasks related to the field of study as well as formulate and solve problems applying recent knowledge of physics and other areas of science	The student analyzes the factors affecting the efficiency of enzymes. He determines the optimal conditions of enzymes.	[SU2] Assessment of ability to analyse information
	[K7_W02] Knows and understands, to an increased extent, selected laws of physics and physical phenomena, as well as methods and theories explaining the complex relationships between them, constituting advanced general knowledge in the field of technical sciences related to the field of study	The student compares methods obtaining enzymes.	[SW1] Assessment of factual knowledge
Subject contents	<p>LECTURE. Properties of enzymes from various sources. Principles of selection of preparations. Suitability of animal organs, plants and microorganisms for the production of enzymes. Advantages of microbiological obtaining of enzymes. Production of enzymes from microbial sources: Dependence of enzyme yield on the composition of the medium and on the conditions and time of culture. Induction of enzyme synthesis. Selection and improvement of microorganisms used as a source of enzymes and methods of their culture. Methods of enzyme separation and pretreatment. Chromatographic methods of enzyme purification. Recombinant enzymes and characteristic methods of their isolation and purification. Applications of enzymes of plant and animal origin. Methods of immobilization and carriers used. Changes in the properties of enzymes after immobilization. Industrial and analytical applications of immobilized enzymes. Prospects for the development of enzyme technologies: Application of enzymes active at low or high temperatures.</p> <p>LABORATORY. Isolation and study of recombinant enzyme activity. Effect of temperature and pH on enzyme activity. Application of amylolytic preparations for making starch syrups. Application of proteolytic preparations for the production of protein hydrolysates.</p>		
Prerequisites and co-requisites	General knowledge about chemistry and basics of biochemistry		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Lecture - written assessment	60.0%	50.0%
	Laboratories, tests, reports	60.0%	50.0%

Recommended reading	Basic literature	Praca zbiorowa pod redakcją J. Synowieckiego, Technologia preparatów enzymatycznych pochodzenia mikrobiologicznego. Wyd. PG, Gdańsk, 2007. Whitehurst R.J., Van Oort M. (2016): Enzymy w technologii spożywczej. Wyd. PWN, Warszawa. Kołakowski E., Bednarski W., Bielecki S. Enzymatyczna modyfikacja składników żywności. WAR, Szczecin, 2005. Ratledge C., Kristiansen B. (2011): Podstawy biotechnologii. PWN, Warszawa
	Supplementary literature	Bednarski W., Reps A. (2001): Biotechnologia żywności. WNT, Warszawa. Porta R., Di Pierro P., Mariniello L. (red.) (2008): Recent Research Developments in Food Biochemistry. Enzymes as Additives or processing aids. Research Signpost.
	eResources addresses	Adresy na platformie eNauczanie: Technologia preparatów enzymatycznych 2023/2024 (dla kierunku Inżynieria Biomedyczna) - Moodle ID: 34901 <a href="https://enauczanie.pg.edu.pl/moodle/course/view.php?id=34901">https://enauczanie.pg.edu.pl/moodle/course/view.php?id=34901</a>
Example issues/ example questions/ tasks being completed	Advantages and disadvantages of enzyme technologies. Applications of proteolytic preparations. Applications of amylolytic preparations.	
Work placement	Not applicable	